



National Aeronautics and  
Space Administration



## TECHNOLOGY SOLUTION

### Information Technology and Software

# Space Link Extension Return Channel Frames (SLE-RCF) Software Library

Monitoring the health and safety of spacecraft

The Lunar Reconnaissance Orbiter (LRO) employs many advanced innovations developed at Goddard and in collaboration with other organizations. The applications and benefits for these technologies are advantageous for many other industries as well. One of those technologies is the Space Link Extension Return Channel Frames (SLE-RCF) software library.

This software library enables a mission control center to receive telemetry frames from a ground station. The technology implements the SLE-RCF protocol as defined by the Consultative Committee for Space Data Systems (CCSDS). Software routines can be reused from mission to mission.

#### BENEFITS

- Offers simple implementation containing less than 30 routines (whereas existing SLE-RCF libraries contain more than 1,000 routines), helping to increase reliability and easing maintenance and enhancement
- Reduces costs by significantly reducing the number of people and time needed to develop new software; for example, for LRO, what formerly would have taken five people working one year to add and modify existing software, took only one person working 3 months to develop new software
- Enables ground stations and mission user facilities across different space agencies to interoperate without the need for ad hoc and custom data communications designs



## THE TECHNOLOGY

The Space Link Extension Return Channel Frames (SLE-RCF) software library helps to monitor the health and safety of spacecraft by enabling space agency ground support and mission control centers to develop standardized and interoperable mission control applications for space telemetry data. The software library eliminates the need for missions to implement custom data communication designs to communicate with any ground station. The two main tasks accomplished via the SLE-RCF software library are processing user requests and receiving data from ground stations and ground support assets.

The software library contains three layers:

- SLE (Space Link Extension) for the abstract workings of the protocol
- DEL (Decoding and Encoding Layer) to decode and encode the abstract messages used by the SLE layer
- TML (Transport Mapping Layer) to transfer the encoded messages via some underlying transport layer protocol, such as the transmission control protocol (TCP)

The library accepts configuration or SLE-RCF directives from the user and responds accordingly. Incoming data, both telemetry frames and status messages, are processed and the appropriate callback routines are triggered by the library.

## APPLICATIONS

The technology has several potential applications:

- Worldwide mission control centers

## PUBLICATIONS

Patent No: 8,094,731

## More Information

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**Agency Licensing Concierge**

**Goddard Space Flight Center**

Code 102

Greenbelt, MD 20771

202-358-7432

Agency-Patent-Licensing@mail.nasa.gov

**www.nasa.gov**

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